



SYDNEY TECHNICAL HIGH  
SCHOOL

2012

TRIAL HIGHER SCHOOL  
CERTIFICATE  
EXAMINATION

# Biology

## General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black or blue pen
- Draw diagrams using pencil
- Approved calculators may be used
- Write your name in the space provided

Student Number

Student Name \_\_\_\_\_

**Total marks – 100**

**Section I** Pages 2 - 21

**85 marks**

This section has two parts, Part A and Part B

Part A – 20 marks

- Attempt Questions 1-20
- Allow about 35 minutes for this part

Part B – 65 marks

- Attempt Questions 21-32
- Allow about 1 hour and 55 minutes for this part

**Section II** Pages 22 - 25

**15 marks**

- Attempt all parts of Question 33
- Allow about 30 minutes for this section

## Section I

85 marks

**Part A – 20 marks**

**Attempt Questions 1-20**

**Allow about 35 minutes for this part**

Use the multiple-choice answer sheet at the back of the paper.

Select the alternative A,B,C or D that best answers the question. Fill in the response oval completely.

Sample:  $2 + 4 =$  (A) 2 (B) 6 (C) 8 (D) 9  
A  B  C  D

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

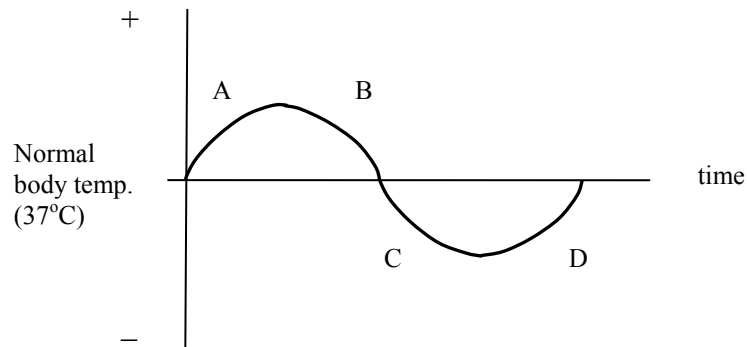
A  B  C  D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

A  B  C  D   
correct

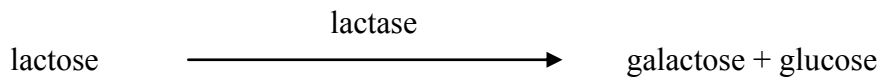
---

1. The graph below shows a person's body temperature fluctuating over a period of time.



At which point(s) are negative feedback mechanisms operating?

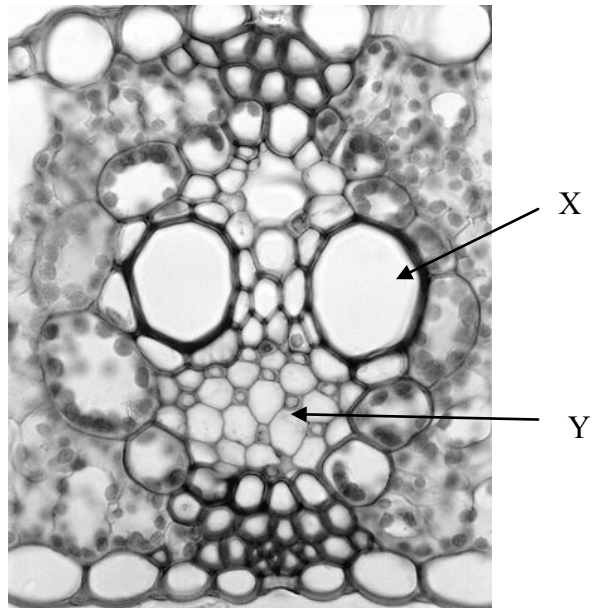
- (A) A
  - (B) B
  - (C) B & C
  - (D) B & D
2. The equation below represents an enzyme mediated reaction.



Which one of the following represents the substrate(s)?

- (A) lactose
- (B) lactase
- (C) galactose
- (D) galactose and glucose

3. The photomicrograph below shows transport tissue in a flowering plant.



Select the row of the table below which correctly identifies the tissues indicated and the type of section.

	Type of section	Tissue X	Tissue Y
(A)	Longitudinal	Xylem	Phloem
(B)	Transverse	Phloem	Xylem
(C)	Longitudinal	Phloem	Xylem
(D)	Transverse	Xylem	Phloem

4. The role of enzymes in metabolism is

- (A) To act as cellular proteins.
- (B) To act as biological catalysts.
- (C) To increase the activation energy of metabolic reactions.
- (D) To increase the time of metabolic reactions.

5. Organic matter is transported around vascular plants. Such matter includes sugars, amino acids and hormones.

Identify the correct statement about this process.

- (A) Transpirational pull moves substances along the phloem.
- (B) Only forces of cohesion and adhesion are needed to transport sugars.
- (C) Translocation moves organic matter from source to sink.
- (D) Movement of organic matter is passive and requires no energy.

6. Select the row below which correctly links the blood products with the conditions they are used to treat.

	<b>Red blood cells</b>	<b>Platelets</b>	<b>Lymphocytes</b>
(A)	Blood clotting problems	Low oxygen carrying capacity	Susceptibility to infection
(B)	Low oxygen carrying capacity	Blood clotting problems	Susceptibility to infection
(C)	Blood clotting problems	Susceptibility to infection	Low oxygen carrying capacity
(D)	Susceptibility to infection	Low oxygen carrying capacity	Blood clotting problems

7. When investigating microbes in food or water you would probably have cultured them on a medium in a petri dish.

What is the role of that medium?

- (A) To prevent contamination by microbes from outside.
- (B) To ensure that any pathogenic organisms that develop can be controlled.
- (C) To provide the microbes with a source of food.
- (D) To provide a background against which microbial colonies can clearly be seen.

8. The trees of the *Casuarina* genus are common in Australia. Their leaves are reduced to small scales arranged around the stem.

Which one of the following best explains why this is an adaptation that helps the plant survive in a dry environment.

- (A) Water is a raw material in photosynthesis. Smaller leaves photosynthesise less, thus conserving water.
- (B) The scale leaves make the stems more streamlined, causing rain which falls to run more efficiently down to the roots.
- (C) The scale leaves break up the air flow over the stems, reducing the evaporation of water from the lenticels.
- (D) The much smaller leaves mean a reduction in overall leaf surface area, reducing water loss through evaporation.

9. The table below summarises the ways in which three Australian animals respond to environmental temperatures

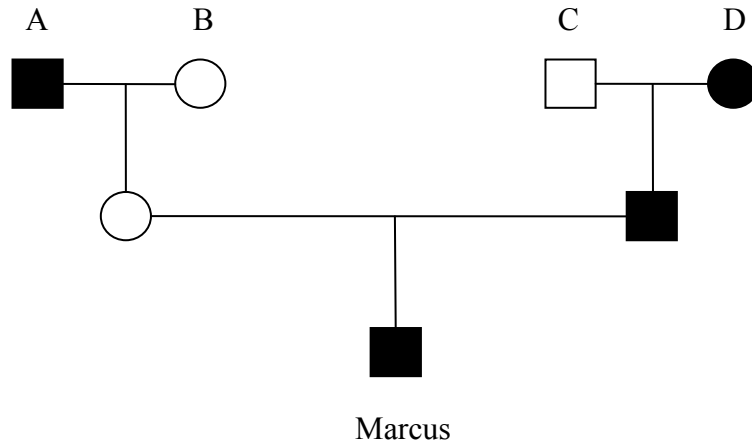
Animal	Response to cold temperatures	Response to hot temperatures
X	Shivering to generate heat	Sweating to lose heat by evaporation
Y	Lying in the sun to absorb heat	Moving into the shade to reduce absorption of heat
Z	Vasoconstriction to reduce heat loss by radiation	Vasodilation to encourage heat loss by radiation.

X, Y and Z are most likely to be respectively:

- (A) ectotherm, endotherm, ectotherm.
- (B) endotherm, ectotherm, endotherm.
- (C) endotherm, endotherm, ectotherm.
- (D) endotherm, ectotherm, ectotherm.

10. The pedigree diagram below shows the inheritance of the sex-linked condition, red-green colour blindness, in a family.

The allele which causes the condition is recessive, and is carried on the X chromosome.



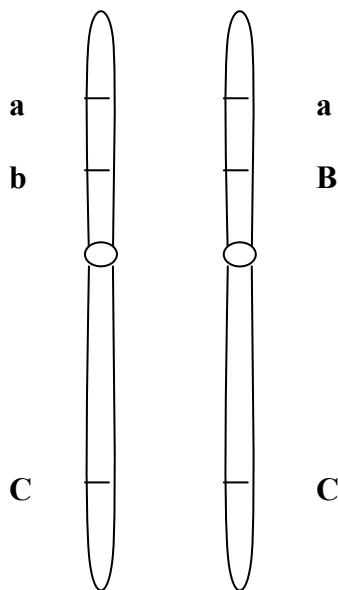
From which one of his grandparents did Marcus inherit the allele for colour blindness?

- (A) A  
(B) B  
(C) Either B or D (not possible to determine which)  
(D) D
11. Polydactyly is the possession of an extra finger or toe. It is determined by a dominant allele.

If a woman is polydactyl, but her father isn't, which one of the following must be true?

- (A) Her mother must be polydactyl.  
(B) Her mother or father must be a carrier, but not show the trait.  
(C) All of her children will be carriers, but not show the trait.  
(D) Her children will all be polydactyl.

12. Which of the following statements describe the main contribution of Sutton and Boveri to our understanding of chromosomes?
- (A) Their studies showed that chromosomes are made up of DNA and protein.
  - (B) They found sex-linked inheritance was associated with the X chromosome.
  - (C) They proved that chromosomes are the fundamental units of heredity.
  - (D) They performed experiments to demonstrate the link between chromosomes and heredity.
13. The diagram below shows a homologous pair of chromosomes. The alleles of three genes are indicated.

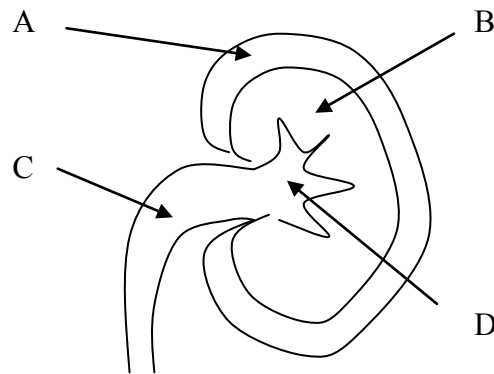


Which one of the following statements is true?

- (A) This person's gametes will all carry the B allele.
- (B) All of this person's offspring will inherit the a allele.
- (C) If this person marries someone with the same genotype, then their children will also have this genotype.
- (D) These two chromosomes can be said to be homozygous.



14. The diagram below shows a mammalian kidney.



Which is the main region associated with the process of filtration?

- (A) A
  - (B) B
  - (C) C
  - (D) D
15. Stomates are structures found on the leaves of ferns, coniferous plants and flowering plants. Their structure and mode of action is very similar in all of these groups

They control water loss from the leaf and the movement of gases between the outside of the plant and air spaces within the leaf.

The presence of stomates in all these groups is a result of:

- (A) common ancestry.
  - (B) convergent evolution
  - (C) divergent evolution
  - (D) adaptive radiation
16. The diagram below shows part of a strand of DNA.  
-A-A-G-T-C-C-

Which is the most likely sequence for the complementary strand?

- (A) -U-U-C-A-G-G-
- (B) -C-C-T-G-A-A-
- (C) -T-T-C-A-G-G-
- (D) -G-G-A-C-T-T-

17. Chemical analysis of the base content of DNA in a newly discovered species showed that it was composed of 15% Cytosine.

Thus the % content of Adenine would be:

- (A) 15%
- (B) 35%
- (C) 70%
- (D) 85%

18. Identify the **incorrect** statement about the lymphatic system.

- (A) Includes lymph nodes, lymphatic vessels, the spleen, thymus and tonsils.
- (B) Contains lymphocytes, macrophages and red blood cells.
- (C) Collects fluid from the extracellular spaces and returns it to the blood.
- (D) Absorbs lipids from the digestive system.

19. Disease can be defined as a condition which:

- (A) interferes with the immune system
- (B) interferes with the body's normal function
- (C) is caused by toxins absorbed into the body
- (D) is caused by a micro-organism or a parasite

20. The cause and mode of transmission of Malaria was determined by

- (A) Koch and Ross
- (B) Ross and Morgan
- (C) Koch and Laveran
- (D) Laveran and Ross

**Part B – 65 marks****Attempt Questions 21 - 32****Allow about 1 hour and 55 minutes for this part**

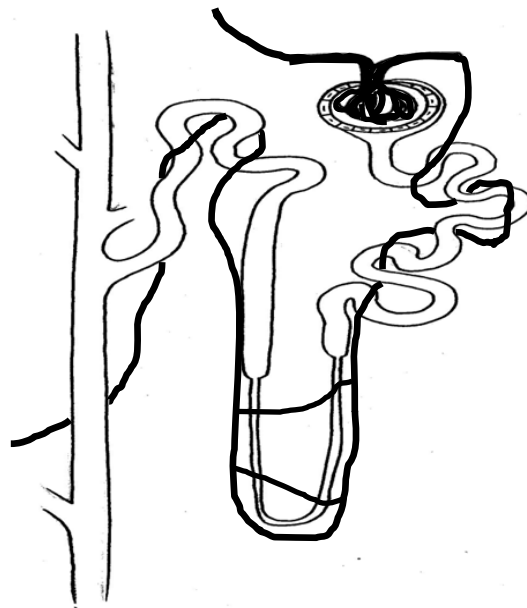
Answer the questions in the spaces provided.

**Marks****Question 21 (3 marks)**

- (a) Complete the table below to identify the forms in which the named substances are transported in human blood. **2**

Substance	Form in which most is transported in the blood
Carbon dioxide	
Nitrogenous waste	

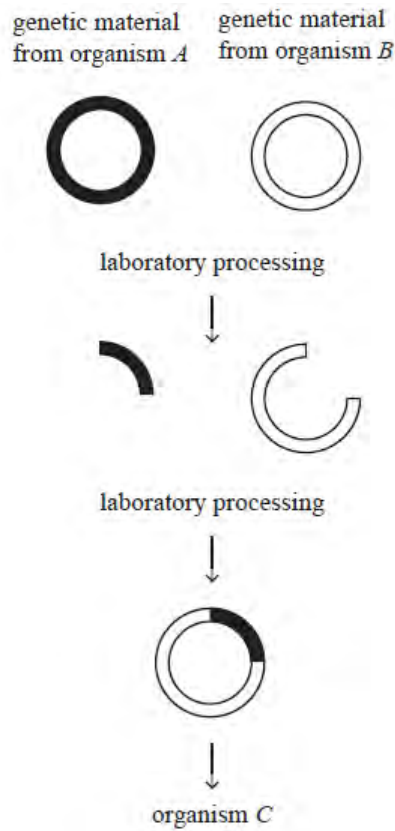
- (b) Indicate, on the diagram of a nephron below, the point at which glucose is reabsorbed back into the blood. **1**



**Question 22** (4 marks)

**Marks**

The diagram below is a simplified version of a process used in modern biotechnology.



(a) Outline what is occurring in this process.

**1**

.....  
.....

(b) Describe what this process is used to produce and the reasons for its use.

**3**

.....  
.....  
.....  
.....  
.....  
.....

**Question 23** (3 marks)

**Marks**

Use a specific example to describe how the theory of evolution is supported by the study of transitional fossils forms.

**3**

.....

.....

.....

.....

.....

.....

.....

**Question 24** (4 marks)

Explain the differences in the urine content and concentration of terrestrial mammals and freshwater fish.

**4**

.....

.....

.....

.....

.....

.....

.....

.....

**Question 25** (6 marks)

**Marks**

(a) Make a labelled drawing of a nucleotide in the space below.

**2**

(b) Construct a flow chart starting with DNA which outlines the steps involved in the production of a polypeptide.

**4**

**Question 26** (6 marks)

**Marks**

(a) Complete the comparative table of pathogens below.

**3**

<b>Pathogen</b>	<b>Description of structure</b>	<b>Example of disease caused by this pathogen</b>
Prion		
Fungi		
Protozoans		

(b) Describe TWO mechanisms which can prevent the entry of pathogens in humans.

**3**

.....

.....

.....

.....

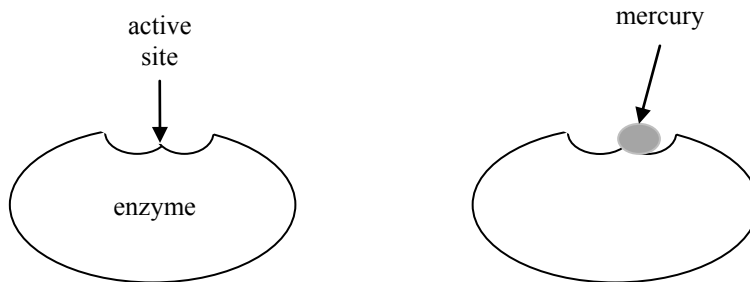
.....

.....

**Question 27** (5 marks)

**Marks**

The diagram below shows how the heavy metal mercury can attach itself to the active site of an enzyme.



(a) Explain why this would inhibit enzyme action.

**2**

.....

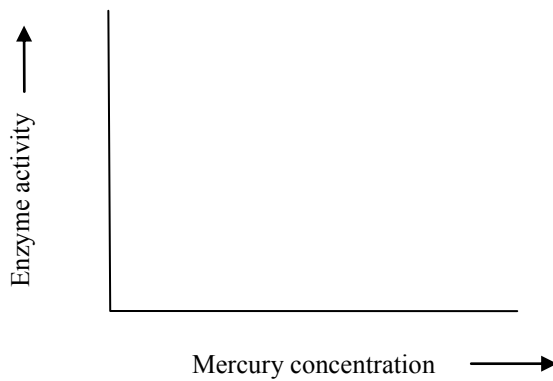
.....

.....

.....

(b) Sketch a line on the graph below to show the effect on enzyme activity that you would expect from increasing mercury concentration.

**1**



(c) Explain why homeostasis is essential for optimal enzyme functioning.

**2**

.....

.....

.....

.....



**Question 28 (7 marks)**

(a) Identify the role of antibiotics in the management of infectious disease. **1**

.....  
.....

(b) *Staphylococcus aureus* (golden staph) is a common micro-organism that lives on the skin or in nasal passages. It may cause a range of mild to severe infections and may cause death.. Drug-resistant strains of this pathogen are common in hospitals.

Explain the mechanism for the development of this antibiotic resistance. **3**

.....  
.....  
.....  
.....  
.....  
.....

(c) Discuss problems relating to the development of antibiotic resistance in pathogens.

..... **3**  
.....  
.....  
.....  
.....  
.....  
.....  
.....

**Question 29** (6 marks)

**Marks**

Productive farmland in many areas is threatened by increasing salinity (salt concentration) of the groundwater.

Rising sea levels due to global warming, and increasing inland salinity due to inappropriate irrigation and land clearing practices are likely to greatly reduce the productivity of many areas in the years to come.

There is an obvious need to develop strains of agricultural crops which can tolerate a certain amount of salinity.

Describe a practical procedure you could follow to assess the ability of a new strain of wheat to tolerate salinity.

**6**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Question 30 (7 marks)**

(a) In the space below, draw a labelled, scaled diagram of a red blood cell.

**3**

(b) Explain the adaptive advantage of haemoglobin in red blood cells.

**4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Question 31 (7 marks)**

**Marks**

Sickle Cell Anaemia is an example of an inherited disease which has a relatively high frequency in West Africa. It is caused by an abnormal haemoglobin protein molecule that causes red blood cells to lose their shape and become sickle shaped. The allele for normal haemoglobin protein and the allele for abnormal haemoglobin are co-dominant.

(a) Explain how this results in three different phenotypes. (Normal, mild sickling and severe sickling)

..... **3**  
.....  
.....  
.....  
.....  
.....

(b) A child born to a West African couple is diagnosed with severe Sickle Cell Anaemia. Determine the chance of their next child inheriting at least one abnormal allele. Show your working in the space below. **2**

(c) Explain why the inheritance of these alleles that exhibit co-dominance does not produce simple Mendelian ratios. **2**  
.....  
.....  
.....  
.....

Question 32 (7 marks)

Explain how an understanding of the sources of variation in organisms has provided support for Darwin/Wallace's theory of evolution by natural selection.

7

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

## Section II

15 marks

Allow about 30 minutes for this section

Answer all parts of this Question in the pages provided. Clearly identify each section.

	<b>Marks</b>
<b>Question 33 --- Communication (15 marks)</b>	
(a) (i) Relate the structure of the iris to its function in the eye.	<b>2</b>
(ii) The pupil is observed to constrict when the eye is exposed to light. Explain this response in the eye by identifying the steps involved in the process.	<b>3</b>
(b) (i) Describe how accommodation is achieved, referring to the role of each of the parts of the eye involved in the process.	<b>3</b>
(ii) Outline an investigation that models the process of accommodation.	<b>3</b>
(c) Describe the technology that can be used to prevent blindness from cataracts and discuss the implications of this technology for society.	<b>4</b>

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





Student Number \_\_\_\_\_

## HSC Biology Trial Exam 2012

### Multiple Choice Answer Sheet

1.    A     B     C     D
2.    A     B     C     D
3.    A     B     C     D
4.    A     B     C     D
5.    A     B     C     D
6.    A     B     C     D
7.    A     B     C     D
8.    A     B     C     D
9.    A     B     C     D
10.    A     B     C     D
11.    A     B     C     D
12.    A     B     C     D
13.    A     B     C     D
14.    A     B     C     D
15.    A     B     C     D
16.    A     B     C     D
17.    A     B     C     D
18.    A     B     C     D
19.    A     B     C     D
20.    A     B     C     D